

Species

Aloe Vera: nature's gift

Balasubramanian J^{1&3*}, Narayanan N²

1. Shield Health Care Pvt Ltd, Chennai-600095, Tamil Nadu, India
2. Jaya College of Pharmacy, Chennai, Tamil Nadu, India
3. Periyar Maniammai University, Thanjavur-613403, Tamil Nadu, India

*Correspondence to: Dr. Mohans Diabetes specialities Centre, Chennai –600 086, India, E-mail: jvbalpharm@yahoo.co.in

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ABSTRACT

Aloe vera is a natural product that is now a day frequently used in the field of cosmetology. Though there are various indications for its use, controlled trials are needed to determine its real efficacy. The aloe vera plant, its properties, mechanism of action and clinical uses are briefly reviewed in this article.

1. INTRODUCTION

The Aloe vera plant has been known and used for centuries for its health, beauty, medicinal and skin care properties. The name Aloe vera derives from the Arabic word “Alloeh” meaning “shining bitter substance,” while “vera” in Latin means “true.” 2000 years ago, the Greek scientists regarded Aloe vera as the universal panacea. The Egyptians called Aloe “the plant of immortality.” Today, the Aloe vera plant has been used for various purposes in dermatology (Marshall, 1990).

Aloe vera's use can be traced back 6,000 years to early Egypt, where the plant was depicted on stone carvings. Known as the “plant of immortality,” aloe was presented as a burial gift to deceased pharaohs. Historically, aloe was used topically to heal wounds and for various skin conditions, and orally as a laxative. Today, in addition to these uses, aloe is used as a folk or traditional remedy for a variety of conditions, including diabetes, asthma, epilepsy, and osteoarthritis. It is also used topically for osteoarthritis, burns, sunburns, and psoriasis. Aloe vera gel can be found in hundreds of skin products, including lotions and sunblocks. The Food and Drug Administration (FDA) has approved aloe vera as a natural food flavoring. Aloe leaves contain a clear gel that is often used as a topical ointment. The green part of the leaf that surrounds the gel can be used to produce a juice or a dried substance (called latex) that is taken by mouth (Tyler, 1993).

- Aloe latex contains strong laxative compounds. Products made with various components of aloe (aloin, aloe-emodin, and barbaloin) were at one time regulated by the FDA as oral over-the-counter (OTC) laxatives. In 2002, the FDA required that all OTC aloe laxative products be removed from the U.S. market or reformulated because the companies that manufactured them did not provide the necessary safety data.
- Early studies show that topical aloe gel may help heal burns and abrasions. One study, however, showed that aloe gel inhibits healing of deep surgical wounds. Aloe gel has not been shown to prevent burns from radiation therapy.
- There is not enough scientific evidence to support aloe vera for any of its other uses.

2. HISTORY

Aloe vera has been used for medicinal purposes in several cultures for millennia: Greece, Egypt, India, Mexico, Japan and China.¹ Egyptian queens Nefertiti and Cleopatra used it as part of their regular beauty regimes. Alexander the Great, and Christopher Columbus used it to treat soldiers' wounds. The first reference to Aloe vera in English was a translation by John Goodyew in A.D. 1655 of Dioscorides' Medical treatise De Materia Medica. By the early 1800s, Aloe vera was in use as a laxative in the United States, but in the mid-1930s, a turning point occurred when it was successfully used to treat chronic and severe radiation dermatitis (Atherton, 1998).

3. PLANT

The botanical name of Aloe vera is *Aloe barbadensis miller*. It belongs to Asphodelaceae (Liliaceae) family, and is a shrubby or arborescent, perennial, xerophytic, succulent, pea- green color plant. It grows mainly in the dry regions of Africa, Asia, Europe and America. In India, it is found in Rajasthan, Andhra Pradesh, Gujarat, Maharashtra and Tamil Nadu.

4. ANATOMY

The plant has triangular, fleshy leaves with serrated edges, yellow tubular flowers and fruits that contain numerous seeds (Shelton, 1991). Each leaf is composed of three layers: 1) An inner clear gel that contains 99% water and rest is made of glucomannans, amino acids, lipids, sterols and vitamins. 2) The middle layer of latex which is the bitter yellow sap and contains anthraquinones and glycosides. 3) The outer thick layer of 15–20 cells called as rind which has protective function and synthesizes carbohydrates and proteins. Inside the rind are vascular bundles responsible for transportation of substances such as water (xylem) and starch (phloem).

5. ACTIVE COMPONENTS WITH ITS PROPERTIES

Aloe vera contains 75 potentially active constituents: vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids and amino acids.

Vitamins: It contains vitamins A (beta-carotene), C and E, which are antioxidants. It also contains vitamin B12, folic acid, and choline. Antioxidant neutralizes free radicals.

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Enzymes: It contains 8 enzymes: aliase, alkaline phosphatase, amylase, bradykinase, carboxypeptidase, catalase, cellulase, lipase, and peroxidase. Bradykinase helps to reduce excessive inflammation when applied to the skin topically, while others help in the breakdown of sugars and fats.

Minerals: It provides calcium, chromium, copper, selenium, magnesium, manganese, potassium, sodium and zinc. They are essential for the proper functioning of various enzyme systems in different metabolic pathways and few are antioxidants.

Sugars: It provides monosaccharides (glucose and fructose) and polysaccharides: (glucomannans/polymannose). These are derived from the mucilage layer of the plant and are known as mucopolysaccharides. The most prominent monosaccharide is mannose-6-phosphate, and the most common polysaccharides are called glucomannans [beta-(1,4)-acetylated mannan]. Acemannan, a prominent glucomannan has also been found. Recently, a glycoprotein with antiallergic properties, called alprogen and novel anti-inflammatory compound, C-glucosyl chromone, has been isolated from Aloe vera gel.

Anthraquinones: It provides 12 anthraquinones, which are phenolic compounds traditionally known as laxatives. Aloin and emodin act as analgesics, antibacterials and antivirals.

Fatty acids: It provides 4 plant steroids; cholesterol, campesterol, β -sisosterol and lupeol. All these have anti-inflammatory action and lupeol also possesses antiseptic and analgesic properties.

Hormones: Auxins and gibberellins that help in wound healing and have anti-inflammatory action.

Others: It provides 20 of the 22 human required *amino acids* and 7 of the 8 essential amino acids. It also contains salicylic acid that possesses anti-inflammatory and antibacterial properties. Lignin, an inert substance, when included in topical preparations, enhances penetrative effect of the other ingredients into the skin. Saponins that are the soapy substances form about 3% of the gel and have cleansing and antiseptic properties.

6. MECHANISM OF ACTIONS

Healing properties: Glucomannan, a mannose-rich polysaccharide, and gibberellin, a growth hormone, interacts with growth factor receptors on the fibroblast, thereby stimulating its activity and proliferation, which in turn significantly increases collagen synthesis after topical and oral Aloe vera. Aloe gel not only increased collagen content of the wound but also changed collagen composition (more type III) and increased the degree of collagen cross linking. Due to this, it accelerated wound contraction and increased the breaking strength of resulting scar tissue. An increased synthesis of hyaluronic acid and dermatan sulfate in the granulation tissue of a healing wound following oral or topical treatment has been reported.

Effects on skin exposure to UV and gamma radiation: Aloe vera gel has been reported to have a protective effect against radiation damage to the skin. Exact role is not known, but following the administration of aloe vera gel, an antioxidant protein, metallothionein, is generated in the skin, which scavenges hydroxyl radicals and prevents suppression of superoxide dismutase and glutathione peroxidase in the skin. It reduces the production and release of skin keratinocyte-derived immunosuppressive cytokines such as interleukin-10 (IL-10) and hence prevents UV-induced suppression of delayed type hypersensitivity.

Anti-inflammatory action: Aloe vera inhibits the cyclooxygenase pathway and reduces prostaglandin E2 production from arachidonic acid. Recently, the novel anti-inflammatory compound called C-glucosyl chromone was isolated from gel extracts.

Effects on the immune system: Alprogen inhibit calcium influx into mast cells, thereby inhibiting the antigen-antibody-mediated release of histamine and leukotriene from mast cells. In a study on mice that had previously been implanted with murine sarcoma cells, acemannan stimulates the synthesis and release of interleukin-1 (IL-1) and tumor necrosis factor from macrophages in mice, which in turn initiated an immune attack that resulted in necrosis and regression of the cancerous cells. Several low-molecular-weight compounds are also capable of inhibiting the release of reactive oxygen free radicals from activated human neutrophils.

Laxative effects: Anthraquinones present in latex are a potent laxative. It increases intestinal water content, stimulates mucus secretion and increases intestinal peristalsis.

Antiviral and antitumor activity: These actions may be due to indirect or direct effects. Indirect effect is due to stimulation of the immune system and direct effect is due to anthraquinones. The anthraquinone aloin inactivates various enveloped viruses such as herpes simplex, varicella zoster and influenza. In recent studies, a polysaccharide fraction has shown to inhibit the binding of benzopyrene to primary rat hepatocytes, thereby preventing the formation of potentially cancer-initiating benzopyrene-DNA adducts. An induction of glutathione S-transferase and an inhibition of the tumor-promoting effects of phorbol myristic acetate has also been reported which suggest a possible benefit of using aloe gel in cancer chemoprevention.

Moisturizing and anti-aging effect: Mucopolysaccharides help in binding moisture into the skin. Aloe stimulates fibroblast which produces the collagen and elastin fibers making the skin more elastic and less wrinkled. It also has cohesive effects on the superficial flaking epidermal cells by sticking them together, which softens the skin. The amino acids also soften hardened skin cells and zinc acts as an astringent to tighten pores. Its moisturizing effects has also been studied in treatment of dry skin associated with occupational exposure where aloe vera gel gloves improved the skin integrity, decreases appearance of fine wrinkle and decreases erythema. It also has anti-acne effect.

Antiseptic effect: Aloe vera contains 6 antiseptic agents: Lupeol, salicylic acid, urea nitrogen, cinnamonic acid, phenols and sulfur. They all have inhibitory action on fungi, bacteria and viruses.

Clinical uses: The clinical use of aloe vera is supported mostly by anecdotal data. Though most of these uses are interesting, controlled trials are essential to determine its effectiveness in all the following diseases.

Conditions: Seborrheic dermatitis, psoriasis vulgaris, genital herpes, skin burns, diabetes (type 2) HIV infection, cancer prevention, ulcerative colitis wound healing (results of aloe on wound healing are mixed with some studies reporting positive results and others showing no benefit or potential worsening), pressure ulcers, mucositis, radiation dermatitis, acne vulgaris, lichen planus, frostbite, aphthous stomatitis, and constipation.

Uses based on tradition or theory: The below uses are based on tradition or scientific theories. They often have not been thoroughly tested in humans, and safety and effectiveness have not always been proven.

Conditions: Alopecia, bacterial and fungal skin infections, chronic leg wounds, parasitic infections, systemic lupus erythematosus, arthritis and tic douloureux.

- Use of topical aloe vera is not associated with significant side effects.
- A 2-year National Toxicology Program (NTP) study on oral consumption of non-decolorized whole leaf extract of aloe vera found clear evidence of carcinogenic activity in male and female rats, based on tumors of the large intestine. According to the NTP, from what is known right now there is nothing that would lead them to believe that these findings are not relevant to humans. However, more information, including how individuals use different types of aloe vera products, is needed to determine the potential risks to humans.
- Abdominal cramps and diarrhea have been reported with oral use of aloe vera.
- Diarrhea, caused by the laxative effect of oral aloe vera, can decrease the absorption of many drugs.

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- People with diabetes who use glucose-lowering medication should be cautious if also taking aloe by mouth because preliminary studies suggest aloe may lower blood glucose levels.
- There have been a few case reports of acute hepatitis from aloe vera taken orally. However, the evidence is not definitive.
- Tell all your health care providers about any complementary health practices you use. Give them a full picture of what you do to manage your health. This will help ensure coordinated and safe care. For tips about talking with your health care providers about *complementary and alternative medicine*, see NCCAM's

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